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ABSTRACT

Scuba diving is often referred to as a "recreational sport." However, the term "sport" sometimes implies erroneous connotations and limits understanding. Scuba diving can be an avocation or a vocation. It is a pastime, a pursuit, or even a lifestyle, that can be as limited or extensive as one makes it. A persons level of commitment, degree of skill, and types of equipment all depend on what he/she wants out of scuba diving. This paper includes discussions of: (1) medical and health considerations; (2) physical fitness; (3) swimming requirements; (4) scuba diving courses; and (5) equipment requirements and costs. (CW)

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DIVER EDUCATION SERIES

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Lee H. Somers

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INTRODUCTION TO SCUBA DIVING

Lee H. Somers, PhD

Scuba diving is most often referred to as a "recreational sport." However, the term "sport" sometimes implies erroneous connotations and limits understanding. Scuba diving can be an avocation or a vocation. It is a pastime, a pursuit, or even a lifestyle, that can be as limited or extensive as you make it. Your level of commitment, degree of skill, and types of equipment all depend on what you want out of scuba diving. You may choose to dive once or twice a year during your Florida or Caribbean vacation. In such cases you will often rent most of your equipment and rely on the knowledge and skill of a "dive guide" for selecting an appropriate dive site and safety. On the other hand, you may find that scuba diving fills the "need" in your life for adventure and challenge. You will acquire the finest equipment and dive throughout the world's oceans. You will progressively develop your skills and knowledge to emcompass all diving environments.

At this point you are preparing for your initial diving training experience. You feel both anticipation and apprehension as you enter your training experience. Many textbooks and diving publications present a glorified impression of scuba diving and the underwater world. DIVING IS FUN! ANYONE CAN DIVE! THERE ARE NO RISKS IN DIVING! On the other hand, some instructors will relate tales of terror and superhuman feats. You are overwhelmed with both conceptions and misconceptions. In the following pages I will attempt to sort some of these things out for you. I ask you to remember one thing. I am interested in your personal health and safety as well as the "quality of experience" that scuba diving will be for you.

MEDICAL AND HEALTH CONSIDERATIONS

One question often asked by my students is, **"Do I really need a medical examination before beginning my scuba diving training?"** It is true that many instructors and instructional agencies accept students into courses **without** requiring a medical examination. The student is requested to complete a medical history or health status form which the instructor will review. If the instructor feels that there are medical conditions that may be inconsistent with safety in diving, the student is advised to see a physician before beginning training. Is this a satisfactory screening system?

In my opinion, all students should complete a medical examination from a qualified physician prior to entering scuba diving training. Why? First, some individuals will not feel comfortable about providing personal health information to a

scuba instructor. Second, in most diving courses the student is unaware of the specific physiological risks associated with diving at the time they complete this form. Consequently, the student may not provide complete information. For example, asthma is considered to be a "disqualification" for diving by most authorities. A student who really wants to learn to scuba dive might have heard that if you mark asthma on the medical history form you will have to see a physician. Maybe the student does not want to risk disqualification or the additional cost of a medical examination. Unaware of the potential risk, the student simply does not mark asthma on the form.

What about the young, healthy individual who exercises regularly? Is there really any risk for this type of person? Do they really need a medical examination? In our university diving program up to 12% of the young, healthy college applicants have been medically disqualified. Generally, about 5% of the applicants are disqualified annually for respiratory or cardiovascular reasons. Yes, even young, apparently healthy people can have previously undetected serious medical problems.

Some individuals or agencies suggest that a medical examination requirement is invalid because most physicians are not familiar enough with the physiology of diving to administer an appropiate examination. I do not feel that this argument is valid today. You can find physicians with some knowledge of diving in most cities. If your physician appears to lack specific knowledge of diving, have him/her obtain an excellent booklet titled, "Medical Examination of Sport Scuba Divers" by Jefferson C. Davis, M.D. (available from Medical Seminars, Inc., Publishing Division, One Elm Place, Suite 204, 11107 Wurzbach, San Antonio, Texas 78230). Edited by Dr. Davis, this booklet contains the collective opinions of 94 contributing physicians and was reviewed by four outstanding diving physicians.

In order to assist you in assessing your personal medical condition for entry into a diving program, I am including a list of questions that you may ask yourself. If you answer **YES** to any question or have any doubt regarding the answers, you may be at some level of potential risk for participation in scuba diving.

1. Do you have a history of seizure inducing disorder?

2. Do you experience significant discomfort and major difficulty in equalizing pressure in your ears and sinuses when you fly or dive to the bottom of a swimming pool?

3. Do you have any history of restrictive or obstructive lung disease?

4. Do you currently have active bronchial asthma, have you experienced symptoms suggestive of asthma such as "wheezing" within the past several years, or are you taking asthma control medications?

5. Are you aware of any cardiovascular problems, taking any medications to control cardiovascular problems (presently or in the past), or restricted in your exercise because of "heart/circulatory" problems?

6. Do you have (or have you had) a punctured eardrum, chronic/active (or recurrent) ear infections?

7. Do you have diabetes mellitus?

8. Have you experienced chest radiation treatments, chest surgery, spontaneous pneumothorax (lung collapse), or tuberculosis?

9. Do you currently have any condition requiring continuous medication such as antihistamines, steroids, barbiturates, mood altering drugs, or insulin for control?

10. Are you pregnant?

These are only some basic questions that would encompass major contraindications to diving. Remember that even though you may have been declared physically fit for athletics previously, you might have some condition that would place you at high risk for scuba diving. For example, a minor obstruction in a small airway might have no significant effect on your ability to participate in strenuous physical activity such as jogging and swimming. However, in scuba diving where you breathe air at higher pressures (ambient underwater pressure), such an obstruction could cause momentary "air trapping" as the air expands when you ascend to the surface, rupturing delicate lung tissue, and allowing entry of air into the circulatory system. These small air bubbles could lodge in the brain with disabling or even life-threatening consequences.

With modern control medications, many persons with diabetes mellitus, seizure disorders (such as epilepsy), and other conditions that might result in loss of consciousness or convulsions do actively participate in exercise and sport activities. However, momentary impairment of consciousness or a seizure on land is not nearly as life threating as the risk of such an episode underwater where near-drowning or drowning is the likely result.

Is any uncertainty worth such dramatic consequences? Even if your instructor does not require a medical examination, I suggest that you voluntarily submit to examination by a physician.

PHYSICAL FITNESS

Nearly anyone can swim underwater while breathing from scuba regardless of their physical fitness level. I have observed individuals at Caribbean dive resorts who appear "out of breath" just from the exertion of walking to the dive boat. Although these individuals appear fairly comfortable underwater, their post-dive "near-exhaustion" level raises doubt in my mind with regard to both safety and quality of experience. How would such an individual respond in a physically or emotionally stressful situation? **Research and experience suggest that both the out-of-shape diver and his/her diving companion could be compromised in a stress situation.**

Some scuba diving situations, particularly for the unskilled novice, can place serious stress on the entire body, especially the cardiovascular and respiratory systems. Anxiety, skill inefficiency, poorly conditioned heart, hyperventilation, obesity, equipment restrictions, breathing resistance, and heat loss are among the many factors which can cause increased heart rate and onset of fatigue. My experience suggests that a person in reasonably good physical condition is a better learner in a scuba diving course and is more apt to be a safe and comfortable diver. **Scuba diving will generally be a higher quality experience for the individual in good physical condition.**

To help students evaluate their personal physical fitness level, I administer the Cooper Aerobic 12-Minute Swimming Test early in my training program. For persons who appear to be poor swimmers, the Cooper 12-Minute Running Test can be substituted. Both tests are "age and sex adjusted." I feel that a student diver should be capable of performing at Fitness Category III (Fair) and that an active diver should attempt to maintain a fitness level of Category IV (Good). This means that a student between the age of 20 and 29 years should be able to swim at least 500 yards (male) or 400 yards (female) in 12 minutes. Complete instructions and fitness charts can be found in "The Aerobics Way" by Kenneth H. Cooper (Bantam Books, New York, 1977).

I must caution you about fitness testing. Since the heart rate and blood pressure cannot be continuously monitored during this field test, there is a certain degree of risk if one takes the test without having been properly conditioned by previous exercise. If you are over 30 years of age, do not take this type of fitness test prior to beginning an exercise program. Cooper suggests that you postpone testing until you have completed a six-week "starter program." All persons should have a basic medical examination prior to testing. Furthermore, if you feel extreme fatigue, shortness of breath, lightheadedness, or nauseous during the fitness test, stop immediately. Do not repeat the test until your fitness level has been gradually improved through regular exercise.

As a general rule, average participation in scuba diving activities is not sufficient to develop and maintain a satisfactory level of physical fitness. Diving must be supplemented by a regular exercise program. Persons who participate in diving only on a seasonal or vacation-time basis should exercise regularly or, at least, initiate a conditioning program six to eight weeks prior to active diving.

Hopefully, your participation in scuba diving will motivate you to improve your overall fitness level and, to some degree, your personal lifestyle. I encourage all students as well as previously trained divers to re-evaluate their current approach toward physical health, stress management, recreation, and general lifestyle. As previously stated, scuba diving can be a lifestyle of its own. As part of this new lifestyle you may wish to initiate a personal health and fitness program. The Cooper aerobic exercise program is a good place to start. Over the past two decades it has been accepted and used by a vast population of "average" people. Detailed and simplified publications describing the program are sold throughout the world. The exercises and fitness levels are both age and sex adjusted. Your personal exercise program can include a variety of activities ranging from running to volleyball and is adaptable to almost any lifestyle or living situation. And, most important, it works!

SWIMMING REQUIREMENTS

"How well do I have to swim in order to be a scuba diver?" A friend told me that you really do very little swimming without fins and mask and that the flotation equipment makes movement underwater and on the surface almost effortless!" The friend is correct, up to a point! A non-swimmer could scuba dive with the aid of this equipment. However, in the event that the scuba or buoyancy system malfunctions or a fin is lost, the "non-swimmer" could be in serious difficulty. And please do not let anyone convince you that such things can't happen. During one resort dive I observed a diver lose a fin and the inflation hose come off of a buoyancy compensator. **Equipment cannot be a substitute for poor watermanship or physical fitness.** A scuba diver must be capable of handling any situation that might involve the loss or malfunction of any or all components of the diving system.

I feel that a person participating in scuba diving should be comfortable in the water. In general, good swimmers are comfortable in the water and poor swimmers are uncomfortable. Furthermore, the more comfortable you are in the water, the "safer" you will be. And, the more comfortable you are the more enjoyable scuba diving will be for you.

"How can I determine if I am comfortable in the water? How will the instructor determine this?" Such determinations are both subjective and objective. First, only you can actually assess your emotional comfort level. If you are experiencing high emotional stress or anxiety when you are asked to swim in the

middle of the pool away from the security of the side or if you struggle to stay afloat and move in the water, you are obviously not comfortable. Many instructors do not include a swimming pre-requisite in their scuba program. Some students are only informed that they will be expected to swim 200 to 300 yards without the aid of equipment before they can be certified. For a poor swimmer who is uncomfortable in the water, the training experience can be unpleasant and the **learning experience compromised.** Such individuals may drop out prior to the end of the course, fail to meet the certification requirements, or "sneak through." I feel such an individual is at high risk, especially the one that "sneaks through." A poor swimmer is far better off in a swimming course. This person can then learn to scuba dive later when he/she can both enjoy and gain maximum benefit from the scuba instruction experience.

As an instructor, how do I evaluate comfort level in prospective students? I talk to the students and I ask them to swim. I personally feel that a person who can swim at least 400 yards without exhibiting signs of exhaustion or serious emotional/physical stress will enjoy a more successful learning experience and be a safer diver. In addition, I ask my students to demonstrate the ability to float or tread water for 15 to 20 minutes, swim 25 yards underwater, and tow a fellow student 25 yards. Other "swim skills" will be observed during the course.

Now for the big question, "What if I can't perform these swimming skills during the first pool session? Will I be disqualified for training?" Not necessarily! If you are having difficulty or can't make the swim, we will talk. Is the reason for your difficulty because of poor swimming skill level? Poor physical condition? Out of practice? Could you swim better when you were younger? Sometime I do allow "poor swimmers" to enroll in my scuba course. If you are one of the "poor" swimmers, I will ask you to make the decision. Would you rather improve your swimming skill in a swim class and enroll in scuba diving at a future time or make a commitment to me and yourself to concurrently improve your swimming skill? It works both ways. I had one individual who could only swim 75 yards at the first pool session. Eight weeks later this individual swam 400 yards in less than 9 minutes and is an excellent scuba diver today. It's called **commitment**! Are you willing to make that commitment to yourself and your instructor? If so, let's go for it! But, remember, you will be a swimmer before I certify you as a scuba diver. I will not put a scuba diver in the ocean unless he/she can swim **at least 400 yards** without fins.

"I am an excellent swimmer and was captain of my high school swim team! Will I be a "natural" scuba diver?" Probably, but not necessarily! A few individuals will not "emotionally" adapt to breathing underwater. Although very rare, such individuals will experience considerable emotional stress and anxiety. They present an unacceptable threat to both themselves and their fellow divers. **However, one must not confuse the natural anxiety that might be associated with learning a new activity such as**

breathing underwater with the deep-seated emotional problem referred to above! If you feel uncomfortable with your first exposures to swimming and breathing underwater, discuss it with your instructor and continue training. Generally, you will be completely at home underwater by the second or third session. Most students will be well adapted by the end of the first session. If your problem is serious, you and your instructor will soon identify it.

SCUBA DIVING COURSES

Your training course will be sanctioned by one or more of the nationally recognized diver training agencies such as the National Association of Underwater Instructors (NAUI), Professional Association of Diving Instructors (PADI), or Scuba Schools International (SSI). The course will include classroom, confined water (generally swimming pool), and openwater training sessions. In the classroom you will learn the fundamentals of diving equipment selection, application, and maintenance; marine life and environmental factors; basic diving physics and physiology; dive accident management and first aid for diving related injuries; dive planning and procedures; use of air decompression and repetitive dive tables and so on. The confined water sessions will include basic skin and scuba diving skills; emergency and rescue procedures; buoyancy control; scuba use and maintenance; and other skills fundamental to safe diving. Upon successful completion of this training and upon passing both written and diving skill tests you will advance to openwater training. Your openwater training program will consist of four to six openwater scuba dives under the direct supervision of an instructor during which you will demonstrate your ability to perform most of the skills that you learned during confined water training, learn new skills such as underwater navigation, and complete an environmental orientation for your geographic location. For most trainees the openwater experience is their first exposure to diving in a thermal protection garment. Most students complete their openwater training within their home geographic area. However, in recent years increasing numbers of students are requesting "referral letters/forms" so that they may complete openwater training during a vacation to the Bahamas or the Caribbean Islands. In fact, many students are now planning their vacations specifically for certification and diving experiences.

"How much does all of this training cost? Will I have to buy my own equipment? How much time will be required?" First, based on an informal survey of dive shops in southeastern Michigan (January 1985) the cost of a complete basic level scuba training course ranged from $120 to $300. Second, for most courses the student was required to purchase, rent, or borrow mask, fins, and snorkel. The cost of these items ranged from $75 to $150 (at retail value without student discount, if any). Third, the amount of training time ranged from 12 to 36 hours plus openwater time (generally 2 diving days with one to three

dives per day). The amount of time spent in confined water ranged from 6 to 18 hours.

Students are encouraged to evaluate courses as much as possible prior to enrollment by talking with friends who have previously taken the course, studying course descriptions/contents, and obtaining a complete accounting of all costs. For example, you might be attracted to a course that costs only $90. After enrollment, you discover that you must spend $35 more for scuba/equipment rental during confined water training, $17 for text/materials, $55 for openwater training, $60 for openwater training equipment rental, and $12 for certification; a total of $269. In this course the combined confined water and classroom time is only 18 hours. On the other hand, another course offering the same certification may be advertised at $210. And, this course **includes** everything with mask, fins, and snorkel supplied for pool sessions. Furthermore, this $210 course consists of 36 hours of confined water and classroom training. I personally feel that 24 hours is the **minimum** amount of time that should be allotted for classroom and confined water training.

EQUIPMENT REQUIREMENTS AND COST

Scuba diving equipment isn't cheap! The type and amount of equipment you purchase depends on the type and amount of diving you expect to do. For example, if you only expect to dive once each year at a Caribbean resort, you could probably get along on the basic mask, fins, and snorkel for $75 to $150 and rent the remainder at the resort. If you expect to do some local diving and make several diving trips, you will want to consider a more complete diving outfit including buoyancy compensator, scuba regulator, exposure suit, and accessories. The following equipment costs are based on approximate retail values of quality equipment and do not reflect student discounts or package deals (if any):

Regulator including pressure gauge, alternate breathing unit, and console with depth gauge, compass, and timer (the present trend)	$550 to $730
Scuba cylinder, backpack, and buoyancy compensator	$500 to $750
Thermal protection garments/suits with boots, hood, and mitts (wet suit) plus weight belt	$300 to $1200
Knife, equipment bag, underwater light, and miscellaneous accessories	$125 to $300

If you dive only in the tropics you may elect to purchase a 1/8-inch foamed neoprene diving suit at a cost of $300 including boots, gloves and hood. On the other hand, if you intend to dive on Great Lakes shipwrecks and extend your activities to four seasons, you will no doubt purchase a good dry suit with thick undergarments at a cost of $700 to $1200. In addition you might want to purchase a wet suit for tropical diving. Thus your equipment investment can range from less than $1000 for the conservative tropical diver to more than $2700 for the northern four-season diver. This does not include underwater photography equipment.

Please don't let these figures scare you! You can save money by shopping for the best buy and watching for sales. And you may not need a "first class" dry suit for the limited amount of diving you will do. However, remember that value is not measured in "dollars" alone. Consider durability, performance, availability of repair/parts on a long term basis, quality of diving experience, and **safety.**

CONCLUSIONS

As a scuba diver you can escape the bonds of the earth's gravity and experience the freedom and exhilaration of weightless flight through the underwater world. You will witness the beauty and the reality of nature and behold sights viewed only by those "surface humans" who have chosen to leave the comfort and security of the atmosphere in order to "experience the underwater adventure" rather than to watch others on a television screen.

By nature, man is an explorer. Can you accept the challenge of exploring the earth's last frontier--the sea? The potential for new discoveries are boundless in this underwater world. In the sea you may also discover yourself. You will learn both your capabilities and your limitations. Drifting freely over a coral garden you enter not only another world of physical beauty, but also a world of emotional and spiritual beauty. Beneath the waves there is peace!

To explore the underwater frontier you must accept the challenge, the risk, and the commitment. Each individual will seek their own level of fulfillment. In a basic scuba diving course you will "learn to learn" to dive. This course will provide you with the basic knowledge and fundamental skills necessary to advance to specialty training programs such as ocean diving, river diving, ice diving, underwater photography, research diving, and diver leadership training. With proper training and considerable personal commitment you can be the inner space explorer of the 21st century!